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MEETING OF THE INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION HELD IN STOCKHOLM, SWEDEN, AUGUST 15–23, 1930

By HERBERT H. KIMBALL, United States Delegate

The opening session of the International Geodetic and Geophysical Union was held at 11 a. m. of August 15, in the "Great Hall of the Concert House." An orchestra gave a musical program, and between numbers the Union was addressed by Mr. Ernst Trygger, Chairman of the Swedish National Committee and Chancellor of the University of Sweden, and by Mr. Ch. Lallemand, Chairman of the International Union.

The printed list of members contains 305 names, including invited guests, and 110 members of their families. The invited guests could take part in discussions, but had not the right to vote. Members of families were invited to the opening meeting and to all social functions.

The following is the list of members, guests, and members of families, of the delegation from the United States:

Members	Members of families
Austin, L. W.	Mrs. Austin.
Bigelow, H. B.[1]	Mrs. Bigelow.[1]
Bowie, W.	Mrs. Bowie.
Briggs, L. J.	
Fleming, J. A.	Mrs. Fleming.
Harradon, R. D.	Mrs. Harradon.
Heck, N. H.	Miss Emma Heck.
Heiland, C. A.[1]	
Keith, A.	Mrs. Keith.
Kennelly, A. E.	Mrs. Kennelly.
Kimball, H. H.	Mrs. Kimball.
Littlehales, G. W.	Littlehales, G. R.[1]
Macelwane, J. B.	
Thompson, G.	Mrs. Thompson.
Wenner, F.	Mrs. Wenner.
Willett, H. C.	
Guests	
Malkovsky, J. A.	
Rossby, C. G.	Mrs. Rossby.
Douglass, A. E.	

Sixteen delegates are listed, of whom Bigelow and Heiland were not present. There were three invited guests present. The names of 13 members of families are listed, of whom 2 were not present. The delegation therefore actually consisted of 14 delegates, 3 invited guests, and 11 members of families, or a total of 28.

Great Britain had a delegation numbering 38, and including such well-known names as Sir Napier Shaw, G. C. Simpson, Professor Turner, who suffered a cerebral hemorrhage as he was about to open the sessions of the Section of Seismology, and who never regained consciousness; Sir Gilbert Walker, Brigadier Winterbotham, Brigadier Jack, Sir Henry Lyons, Dr. F. J. W. Whipple, G. I. Taylor, Professor Chapman, Professor Dobson, Sir John Flett, Doctor Mitchell, O. R. Hinks, and others.

This was a strong delegation, but was outnumbered by the French delegation with its 45 members, and also by that from Sweden, although the last named was composed largely of invited guests.

At 3 p. m., August 15, the first plenary session of the Union was held in the Parliament House, thus setting in motion the machinery of the Fourth General Assembly.

The real work of the Union is done through its sections and commissions. Some of the latter were in session for several days before the formal convening of the Union. Among these was the Commission on Solar Radiation of the Meteorological Section, of which the writer was chairman. There were informal discussions on August 13, and the first formal meeting convened at 10 a. m., August 14, in a committee room of the Parliament House. It brought together a rather distinguished body of men, among whom were Sir Napier Shaw, Doctor Simpson, Doctor Lindholm of Davos, Doctor Götz of Arosa, Doctor Dobson of Oxford, Professor Maurain of the Geophysical Institute, University of Paris, Professor Volochine, Doctor Gorczyński, Doctor Rossby and Doctor Willett of the Massachusetts Institute of Technology, and others.

Doctor Ångström acted as secretary.

The report of the chairman was the first item considered, and very soon the question of the relation between the commission of the International Geodetic and Geophysical Union and that of the International Meteorological Committee came up. It was first discussed at some length by Sir Napier, who advocated relations much like those proposed by Professor Marvin at the last meeting of the American Geophysical Union. Others followed, and without a formal resolution it was agreed that in future the commission of the International Geodetic and Geophysical Union should function only for the purpose of considering questions relating to solar radiation that might arise at meetings of the Meteorological Section. Research problems might be assigned to special subcommissions, but questions relating to routine work, such as the standardization of instruments, and methods of measurement and publication, would be left to the Commission of the International Meteorological Committee.

The Commission was in session until 11:20 a. m., when several of the members, including the secretary, were obliged to withdraw to attend another meeting. At 2:30 p. m. a second session opened, and a third was

[1] Not present.

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called for 11:30 a. m. of the 16th. A final session was held during the afternoon of August 18 to put resolutions that had been agreed upon in proper shape to present before the Meteorological Section.

There were also meetings of joint commissions, made up from members of different sections, that are deserving of mention as follows:

1. A mixed commission from the sections of Oceanography and Meteorology, to consider means of determining the extent of the polar ice caps and their effects upon weather conditions in the two hemispheres. For their conclusions see resolution XII, of the Meteorological Section. It was stated that reports from British ships show four maximum extensions of the ice sheet northwards in Antarctica, one in 1918 when there were few observations and the other three at times of sun-spot maxima. The year 1918 also had a maximum of spots.

2. A joint meeting of the sections of Magnetism and Meteorology had appointed a commission to consider the project of the polar year. Doctor La Cour had discussed this project with me at length on the train as we returned to Stockholm from our visit to Uppsala on August 20. An agreement was then reached for a meeting at 9 a. m. on the following morning. We met at 9:15, and after discussion adopted resolutions 1 to 5, which follow.

RESOLUTION 1

The subcommission appointed to report on the project of a second polar year planned by the International Meteorological Organization considers that the project is of very great importance for the advancement of physical science. It also approves the suggestion that the observations should not be confined only to Polar regions.

RESOLUTION 2

The subcommission recommends that the Union should support the steps already taken by the International Meteorological Organization to effect international cooperation, and in particular all members of the Union are requested to use their influence to obtain the active cooperation of their Governments and scientific institutions.

RESOLUTION 3

The subcommission is impressed with the desirability that all cameras, plates, and spectroscopes used in the observations of the Aurora should be of equal sensitivity; it therefore recommends that the magnetic section should vote a sum of 15,000 gold francs for the provision of instruments of the standard type.

RESOLUTION 4

The subcommission recommends that all observations should be reduced according to an agreed plan, and that the commission for the polar year should consider the best method for making the detailed observations available for study by all those interested. It also suggests that all published volumes should be put on sale, and that the various sections of the Union should subscribe for a number of copies.

RESOLUTION 5

The subcommission recommends that the Section of Meteorology and the Section of Terrestrial Magnetism and Electricity should jointly submit the following resolution to the general assembly of the Union: "The Union accepts the invitation of the International Meteorological Organization to cooperate with them in organizing and carrying out a second polar year with a similar object to that of the first polar year 1882–83; and appoints the following commission for this purpose: Störmer, chairman; Chapman, La Cour, Maurain, Wehrle."

The Meteorological Section of the Union was in session in the morning and again in the afternoon of August 16. At the morning session the president, Sir Napier Shaw, read the report of the bureau of the section. In it he reviewed 50 years of meteorological work with which he has been actively associated. At this time he also discussed at length relations between the meteorological section and the International Meteorological Committee. He laid down the broad principle that routine matters of administration and observation should be left to the International Meteorological Committee, and that the Meteorological Section of the Union should concentrate on research problems.

At the afternoon session M. Eredia discussed briefly his report on the choice of meteorological factors necessary to express the climatic character of a place, and stated that he did not wish to pursue the subject further, as it fell within the domain of the International Meteorological Committee. I pointed out that this was in accord with the views expressed by Professor Henry at the meeting of the Meteorological Section of the American Geophysical Union, at its recent annual meeting.

Doctor Hanzlik presented a supplement to his former report on methods of measuring rainfall. It was voted that the complete report, together with remarks by Mr. Kadel given in the Transactions of the American Geophysical Union, Tenth Annual Meeting, be referred to the International Meteorological Committee for its consideration.

On August 18, at a morning session of the Meteorological Section Sir Napier Shaw gave an interesting talk on Entropy and Tephigrams, and a few matters of minor importance were disposed of.

On August 19 the order of the day for the Meteorological Section called for the presentation of the report of the Commission on Solar Radiation. By way of introduction the chairman, Sir Napier Shaw, remarked that the most important problem now facing meteorologists is to learn the process by which solar radiant energy is converted into the energy of weather phenomena.

In accordance with principles already adopted, I requested that the "Instructions for obtaining pyrheliometric observations" be referred to the International Meteorological Committee. The request was granted. The resolutions transmitted by the American Geophysical Union, as modified by the commission were then presented and adopted.

Among the items submitted by the Bureau of the Meteorological Section of the American Geophysical Union to the Bureau of the Meteorological Section of the International Geodetic and Geophysical Union was a request from Dr. C. F. Brooks that the taking of water temperatures by vessels at sea be included in the program for the international polar year. Upon my motion, this request was referred to the International Meteorological Committee.

The following papers that had been presented before the Solar Radiation Commission were read by title with the understanding that they would be published in the volume of the Procès-Verbaux of the commission.

VOLOCHINE, F.
The International Actinometric Laboratory at Trappes.

GORCZYŃSKI, L.
Some results of the maritime actinometric measurements effected on the Atlantic and Indian Oceans in 1923 to 1928. (NOTE.—A resolution requesting that such observations be included in the program for the polar year was referred to the International Meteorological Committee.)

KALATIN, N. N.
On a study of the intensity of the radiation of the celestial vault about the sun.

BRAZIER, C. E.
Report on the actinometric work at the Parc St. Maur Observatory in 1927 to 1930.

LINDHOLM, F.
Density of the optical diffusion characterizing the atmosphere when moderately turbid.

BOEREMA, J.
Ultraviolet solar radiation on Java.

Certain other papers were then presented, among them two by H. H. Clayton on Atmospheric and Solar Variations, and on Solar and Meteorological Cycles. Doctor Rossby gave a summary of the first, and exhibited numerous diagrams, which attracted considerable attention.

At this session of the section I took occasion to resign the Chairmanship of the Commission on Solar Radiation and nominated Dr. A. Ångström as my successor, who was unanimously elected.

On August 20 the Union was taken to Uppsala to visit the university and the various institutions associated with it, including the Meteorological Institute. I confined my visit to the Meteorological Institute, the University Library, and the University Club.

On the morning of August 21 the Meteorological Section was in session from 9:45 a. m. to 11:30 a. m. It listened to papers, and tentatively adopted resolutions upon which definite action was to be taken at the final meeting of the section. There was some warm discussion over indorsing the recommendation of the International Meteorological Committee with reference to the use of the geodynamic meter instead of the meter as the unit of height in aerological studies. The British delegation generally bitterly opposed it. The American delegation voted for it, as it seemed a serious matter to refuse to cooperate with the International Meteorological Committee in this matter.

On the question of the appointment of a committee to take up the work of preparing synoptic charts of the weather in the Southern Hemisphere the American delegates voted with the British against the proposition, resulting in its defeat. Three years inactivity seemed to show that meteorologists in the Southern Hemisphere either will not or else can not assemble sufficient data to construct a synoptic weather chart for this hemisphere.

At this session Director Wallén was elected chairman of the section to succeed Sir Napier Shaw, who had stated at Prague that under no circumstances would he serve longer than three years.

On the afternoon of the 21st I visited the Meteorological Institute at Stockholm. I was especially interested in the display of Ångström pyrheliometric apparatus of different types, for measuring and recording direct solar radiation, the total radiation and the outgoing effective radiation.

On the morning of the 22d the Meteorological Section passed finally on resolutions already tentatively adopted, and adopted the report of the budget committee, with the proviso that the bureau as now constituted should have authority to change the totals allotted to different items as might seem desirable. The resolutions adopted and the report of the budget committee follow:

RESOLUTION I

Relative to the proposal of M. Eredia the Section of Meteorology states that the question as to what meteorological data are indispensable for the synthetic characterization of the climate of a given locality is a matter under the jurisdiction of the International Commission on Climatology, International Meteorological Organization. Discussion of this subject will not be entered, but the report of M. Eredia will be published in the appendix to the Proceedings of the Section as a first contribution to the study of the problem.

RESOLUTION II

The section congratulates M. Hanzlik on the important work that he has accomplished in completing his second report on pluviometric measurements. The section instructs its bureau to communicate to the International Meteorological Organization the results of the investigation by M. Hanzlik and also the views of the American Geophysical Union relative thereto, pointing out the necessity of standardizing pluviometric instruments and methods, it being understood that the charge of determining and realizing this standardization rests with the International Meteorological Organization.

RESOLUTION III

On account of the difficulties experienced in reproducing the charts illustrating the 18 reports of the practice of weather forecasting, the section instructs its secretary to communicate directly with each director forwarding such report, for the purpose of obtaining, if possible, the printing of 500 copies of the charts illustrating his report. In view of the great interest attached to this publication the section hopes that the directors will make an effort to comply with the request that will be addressed to them.

RESOLUTION IV

The section is agreed relative to the limiting in a general manner of the privileges of the section to the study of the meteorological questions that call for collaboration with one or more of the branches of geophysics that do not depend on the International Organization. The sphere of the section should be extended to other questions that may have practical applications, which, however, are yet in the period of scientific incubation, and the crystallization of which necessitates exchanges of views between experts before the International Meteorological Organization can take useful cognizance of them. Sufficient time should certainly be reserved for the proper discussion of scientific subjects.

The work of the section would consist, then, chiefly of the discussion of scientific questions. It may be remarked here that the Union does not intend to replace the usual means of publication of scientific ideas. The question of cooperation between the organizations should be capable of adjustment, but only after experience.

RESOLUTION V

Because of the importance given to isentropic surfaces by Helmholtz, Margules, and others, the International Meteorological Organization is requested to take under consideration the possibility of introducing into the publication of daily observations the data necessary for the calculation of the entropy of the air.

RESOLUTION VI

The Radiation Commission emphasizes the importance of defining the turbidity of the air in a simple quantitative manner in order that it can easily be used in synoptic studies and eventually included in synoptic wireless issues.

The attention of the International Meteorological Organization is drawn to this matter, and reference is made to the works of Linke, Kimball, and Ångström, where such definitions are proposed. It is suggested that the gentlemen mentioned might be asked to collaborate.

RESOLUTION VII

As a consequence of the statement of the problem of atmospheric ozone by Doctor Dobson, the section approves the general program of research outlined by him, and expresses the importance that it attaches to these researches.

The section approves the appointment by its commission on solar radiation of a subcommission on atmospheric ozone, consisting of Messrs. Abbot, Ångström, Chalange, Dobson (chairman), Fabry, Götz, Kimball, and Ladenburg.

RESOLUTION VIII

Realizing the importance of a final conclusion regarding the establishment of an absolute pyrheliometer, the section expresses the hope that the Commission on Solar Radiation, International Meteorological Organization, will press on with the investigations that they initiated at their meetings at Davos and Copenhagen. (See Resolutions II, III, and IV, Davos Session and Resolution IV, Copenhagen Session.)

RESOLUTION IX

The Meteorological Section welcomes the establishment in Trappes, by the help of the Czechoslovakian Government, of a central actinometric institute which will cooperate with the institutes at Potsdam, Stockholm, Washington, and Parc Saint Maur in investigations directed toward the production of a standard actimometer.

The section trusts that the work will continue to be supported by the Czechoslovakian Government.

RESOLUTION X

The Commission on Radiation has examined with interest the draft copy of a bibliography of works on radiation which Professor Voloschine proposes to prepare and publish. In view of the usefulness of such a bibliography the commission recommends that the Meteorological Section make a contribution toward the cost of publication.

Professor Voloschine estimates that the cost of preparation and publication will be approximately £500.

RESOLUTION XI

The section recommends the systematic observation of rains of mud in the regions where they are not rare (for example, in the western Mediterranean basin) and the collaboration of meteorologists and mineralogists with the view of determining (*a*) the frequency of the phenomenon, (*b*) the origin of the dust and the path of the particles, (*c*) the variations in the composition of the mud either by progressive sedimentation in the atmosphere or as a function of the location relative to dust currents, (*d*) the class of clouds associated with the phenomenon and their direction, and (*e*) the accompanying optical phenomena.

RESOLUTION XII

Connection with oceanography. The section notes that there are important relations between the extension of polar ice and the seasonal character of the weather over large areas. It considers that the present information on ice is not so complete as it might be and that it would be very interesting to develop it by means of an international organization particularly during the polar year.

RESOLUTION XIII

On learning the ideas of M. Lugeon on sounding by atmospherics (*Sondage par les atmosphériques*) and considering their interest from the viewpoint of dynamic meteorology, the section expresses the desire that similar researches may be pursued in different countries. The section calls the attention of the International Scientific Radiotelegraphic Union to this matter and points out to the Commission on Atmospherics of that organization the interest that there would be from the meteorological point of view in organizing an international network for recording atmospherics especially during the polar year and in collecting and publishing the results.

SCHEME OF THE BUDGET OF THE SECTION OF METEOROLOGY

The financial report placed before the session by the bureau of the section anticipated after balancing receipts and expenditures for 1927–1930, a credit balance of 25,869 francs. Since, however, the total of the apportionments for 1928 and 1929 amounted to 98,099 francs instead of 59,000 francs, as anticipated in the report based on the apportionment of 1927, the credit balance is now found to be 64,986 francs.

In addition, the annual apportionment to meteorology for the next fiscal period will probably be carried as 100,000 francs. There are, then, 365,000 francs that will be at the disposal of the section in this next 3-year period.

CREDITS

	Francs
Balance for the period 1927–1930	64, 968
Apportionments for the period 1930–1933	300, 000
Total credits	364, 968

DEBITS

	Francs
Expenses of the bureau (correspondence through the secretariat and printing)	37, 000
Expenses of one session of the bureau between the sessions of the Union	12, 378
Subscription to the publication of La Haute Atmosphere (3 years)	27, 851
Subscription to the publication of Charts of the Northern Hemisphere	60, 000
Contribution toward the publication of the bibliography of solar radiation compiled by the Actinometric Library at Trappes (recommended by the Commission on Solar Radiation)	62, 500
Grant to the polar year in the form of a prize to be given for the first model of an automatic meteorological station giving satisfactory results and put into working order before Jan. 1, 1932	50, 000
Grant to the projected experiment in short-range forecasting from pressure charts after the new method of M. Giâo based on hydrodynamics of disturbances	40, 000
Total expenses	289, 729
Reserve	75, 239
Total debits	364, 968

At 12:20 p. m. of the 22d Doctor Ångström conducted a party that included Doctor Gorczyński, Professor Linke, Doctor Götz, and myself, to Stocksund, to visit the pyrheliometric observing station. It is well located on a hill in the open country more than a half hour's automobile ride from Stockholm. The observer, Mr. Aúren, lives in the observatory building with his family. Most of the instruments are photographically recording, and few check readings are made.

Professor Linke proposed informally that the name *Langley* be used to designate the unit of solar radiation instead of the present cumbersome expression "gram-calories per minute per square centimeter." Later he stated that some of the leaders in solar radiation research had agreed to join him in using this name in future papers. I did not agree to join them in this invitation until I had had opportunity to consult with Professor Marvin and Doctor Abbot.

The final meeting of the Union was scheduled for 10:30 a. m. of August 23. It convened shortly before 11 a. m. The question of adopting proposed changes in the constitution was on the agenda. As each proposed change was read the president asked that consideration be deferred until the next meeting, three years hence. There were murmurs of dissent, but the president had his way until the amendment was reached which provided that a president should not be eligible for reelection at the expiration of his term of office. The president asked that action on this amendment be deferred also, but Doctor Simpson, of England; Doctor Bowie, of the United States; Professor Mercanton, of Switzerland, and others, protested that if this policy of postponing action on every disputed question was continued, none of them could expect to again be sent as a delegate to an assembly of the International Geodetic and Geophysical Union.

After considerable delay the amendment was finally adopted, Belgium alone voting against it.

Lisbon, Portugal, was selected as the place for the assembly in 1933.

This was not only the largest general assembly of the International Geodetic and Geophysical Union yet held but, as far as the meteorological section was concerned, the most successful. More definite research problems were discussed and acted upon than at any previous meeting, and there was more cooperation with other sections, notably the sections of oceanography and terrestrial magnetism. I am of the opinion that too much time was taken up by the presentation of unimportant papers, and that the Bureaus of National Unions should scrutinize with more care resolutions and papers that are presented to it for transmission to the Bureau of the International Union.

The outstanding problem for the next three years is the financing and carrying out of the program for the international polar year, 1932–33. Doctor La Cour and others who are developing the program are hoping for financial aid, not only from Governments but also from scientific institutions. Since this is the fiftieth anniversary of the Greely expedition it would seem that institutions in the United States should respond generously.